9th Class 2015		
Chemistry	Group-II	Paper-I
Time: 2.45 Hours	(Subjective Type)	Max. Marks: 63

(Part-I)

2. Write short answers to any Five (5) questions: 10

(i) Define Organic and Inorganic Chemistry.

Ans Organic Chemistry is the study of covalent compounds of carbon and hydrogen-hydrocarbons and their derivatives.

Inorganic Chemistry deals with the study of all elements and their compounds except those of compounds of carbon and hydrogen-hydrocarbons and their derivatives.

(ii) Define Tri-atomic and Hetero-atomic Molecule and give one example to each.

Ans A molecule containing same type of atoms is called homo-atomic molecule. If it consists of three atoms, it is called tri-atomic. For example: hydrogen (H_2), ozone (O_3), sulphur (S_8) and phosphorus (P_4). When a molecule consists of different kinds of atoms, it is called hetero-atomic molecule. For example: CO_2, H_2O and NH_3.

(iii) Find out the molecules in 9 gram of water.

Ans

Mass of water = 9 gram

Molar mass of water = 18 g mol^{-1}

$$\text{Moles of water} = \frac{\text{Mass of water}}{\text{Molar mass of water}} = \frac{9}{18}$$

$$= 0.5 \text{ Mole}$$

$$\text{Molecules of water} = 6.02 \times 10^{23} \times \text{Moles of water}$$

$$= 6.02 \times 10^{23} \times 0.5$$

$$= 3.01 \times 10^{23} \text{ Molecules}$$

(iv) **Write the electronic configuration of Phosphorus ion $^{31}_{15}P^{3-}$ and how many neutrons are in it.**

Ans Electronic configuration of $^{31}_{15}P^{3-}$ = 2, 8, 8 (K, L, M)

$1s^2, 2s^2, 2p^6, 3s^2, 3p^6$

No. of neutrons = 16

(v) **For what purpose U-235 is used?**

Ans U-235 is used to generate electricity by carrying out controlled nuclear fission reactions in nuclear reactions.

(vi) **What are the defects of Rutherford's atomic model?**

Ans It had following defects:

1. According to classical theory, electrons being the charged particles should release or emit energy continuously and they should ultimately fall into the nucleus.
2. If the electrons emit energy continuously, they should form a continuous spectrum but, in fact, line spectrum was observed.

(vii) **Describe the classification of Dobereiner's triads and give one example.**

Ans A German chemist Dobereiner observed relationship between atomic masses of several groups of three elements called triads. In these groups, the central or middle element had atomic mass average of the other two elements. One triad group example is that of calcium (40), strontium (88) and barium (137). The atomic mass of strontium is the average of the atomic masses of calcium and barium.

(viii) **Define Shielding Effect. Describe its trend along the period.**

Ans The electrons present in the filled energy levels screen or shield the force of attraction of nucleus felt by the valence shell electrons. This is called as shielding effect. With increase of atomic number, the number of electrons in an atom also increases, that results in increase of shielding effect.

Similarly, the shielding effect decreases in a period if we move from left to right.

3. Write short answers to any Six (6) questions: 12

(i) What are the elements arranged in group 3 to 12 called?

Ans The groups 3 to 12 are called transition elements. In these elements, 'd' sub-shell is in the process of completion.

(ii) Why a covalent bond becomes polar?

Ans When two atoms approach each other, attractive forces develop between electrons of one atom and nucleus of other atom. Simultaneously, repulsive forces between electrons of the two atoms as well as between their nuclei are also created. When the attractive forces dominate due to decrease in distance between those two atoms, a chemical bond is formed between them.

(iii) Define Diffusion.

Ans Diffusion is defined as spontaneous mixing up of molecules by random motion and collision to form a homogeneous mixture. Diffusion depends upon the molecular mass of gases. Lighter gases diffuse more rapidly than heavier ones.

(iv) What is absolute zero temperature?

Ans Lord Kelvin introduced absolute temperature scale or Kelvin scale. This scale of temperature starts from 0 K or –273.15°C, which is given the name of absolute zero. It is the temperature at which an ideal gas would have zero volume.

(v) What is Allotropy?

Ans The existence of an element in more than one forms in same physical state is called allotropy.

(vi) Write down example of a solution in which solute is liquid and solvent is gas.

Ans Mist, fog, liquid air pollutants.

(vii) How one molar solution is prepared?

Ans One molar solution is prepared by dissolving 1 mole (molar mass) of the solute in sufficient amount of water to make the total volume of the solution up to 1 dm^3 in a measuring flask. For example, 1 M solution of NaOH is prepared by dissolving 40 g of NaOH in sufficient water to make the total volume 1 dm^3.

(viii) Define the term vapour pressure.

Ans The pressure exerted by the vapours of a liquid at equilibrium with the liquid at a particular temperature is called vapour pressure of a liquid.

(ix) Define Colloid.

Ans These are solutions in which the solute particles are larger than those present in the true solution but not large enough to be seen by naked eye.

Examples are starch, albumin and soap solutions, blood, milk, ink, jelly, toothpaste, etc.

4. Write short answers to any Five (5) questions: 10

(i) Define oxidation state with example.

Ans Oxidation state or oxidation number (O.N.) is the apparent charge assigned to an atom of an element in a molecule or in an ion *e.g.*, in HCl, oxidation number of H is +1 and that of Cl is –1.

(ii) Define redox reactions.

Ans Chemical reactions in which the oxidation state of one or more substances changes are called oxidation-reduction or redox reactions.

(iii) Find out oxidation number of nitrogen in HNO_3 when: H = +1, O = –2

Ans By applying formula that the compound sum of all oxidation numbers is zero. In case of this compound HNO_3 it becomes:

[O.N. of H] + [O.N. of N] + 3[O.N. of O] = 0

Putting these values in formula

$$[+1] + [\text{O.N of N}] + 3[-2] = 0$$

$$+1 + \text{O.N of N} + [-6] = 0$$

or $$\text{O.N of Nitrogen} = 6 - 1$$

$$= +5$$

(iv) Define weak electrolytes and give an example.

Ans The substances which ionize to small extent when dissolved in water and could not produce more ions are called weak electrolytes. Acetic acid (CH_3COOH) and $Ca(OH)_2$ when dissolved in water, ionize to a small extent and are good examples of weak electrolytes. Weak electrolytes do not ionize completely. For example, ionization of acetic acid in water produces less ions:

$$CH_3COOH_{(l)} + H_2O_{(l)} \rightleftharpoons CH_3COO^-_{(aq)} + H_3O^+_{(aq)}$$

As a result, the weak electrolyte is a poor conductor of electricity.

(v) How the half cells of galvanic cell are connected? What is the function of salt bridge?

Ans A galvanic cell consists of two cells, each called as half cell, connected electrically by a salt-bridge. In each of the half-cell, an electrode is dipped in 1 M solution of its own salt and connected through a wire to an external circuit.

(vi) Define metallic character and give an example.

Ans Metals have the tendency to lose their valence electrons. This property of a metal is termed as electropositivity or metallic character. The more easily a metal loses its electrons, the more electropositive it is. The number of electrons lost by an atom of a metal is called its valency. For example, sodium atom can lose 1 electron to form a positive ion

$$Na_{(s)} \longrightarrow Na^+_{(g)} + 1e^-$$

So the valency of sodium metal is 1.

Similarly, zinc metal can lose 2 electrons from its valence shell. Therefore, its valency is 2.

$$Zn_{(s)} \longrightarrow Zn^{2+}_{(g)} + 2e^-$$

(vii) Write down two uses of gold.

Ans Uses of gold:

1. Because of its inertness in atmosphere, gold is an ornamental metal as well as used in making coins.
2. Gold is too soft to be used as such. It is always alloyed with copper, silver or some other metal.

(viii) Why Platinum is used for making jewelry?

Ans Platinum is used to make jewelry items because of its unique characteristics like colour, beauty, strength, flexibility and resistance to tarnish. It provides a secure setting for diamonds and other gemstones, enhancing their brilliance.

(Part-II)

NOTE: Attempt any Three (3) questions.

Q.5.(a) Write down any three differences between Atomic Number and Mass Number. (3)

Ans Differences between atomic number and mass number:

	Atomic Number		Mass Number
1.	The atomic number of an element is equal to the no. of protons present in the nucleus of its atoms.	1.	The mass number is the sum of number of protons and neutrons present in the nucleus of an atom.
2.	It is represented by symbol 'Z'.	2.	It is represented by symbol 'A'.
3.	For example, all hydrogen atoms have 1 proton, their atomic no. Z = 1.	3.	For example, Hydrogen atom has one proton and zero no. of neutron in its nucleus, its mass number A = 1 + 0 = 1.

(b) Describe the Rutherford's Atomic Model. (4)

Ans Rutherford performed 'Gold Foil' experiment to understand how negative and positive charges could coexist in an atom. He bombarded α-particles on a 0.00004 cm thick gold foil. Alpha particles are emitted by radioactive elements like radium and polonium. These are actually helium nuclei (He^{2+}). They can penetrate through matter to some extent.

He observed the effects of α-particles on a photographic plate or a screen coated with zinc sulphide as shown in figure. He proved that the 'plum-pudding' model of the atom was not correct.

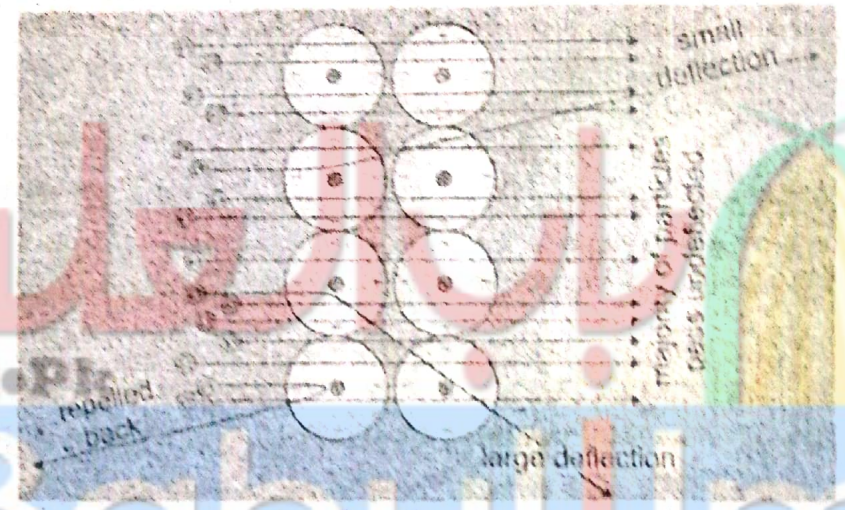


Fig: Rutherford's atomic model.

Observations made by Rutherford were as follows:

(i) Almost all the particles passed through the foil were un-deflected.

(ii) Out of 20,000 particles, only a few were deflected at fairly large angles and very few bounced back on hitting the gold foil.

Results of the experiment:

Keeping in view the experiment, Rutherford proposed planetary model for an atom and concluded following results:

(i) Since most of the particles passed through the foil un-deflected, therefore, most of the volume occupied by an atom is empty.

(ii) The deflection of a few particles proved that there is a 'center of positive charges' in an atom, which is called 'nucleus' of an atom.

(iii) The complete rebounce of a few particles show that the nucleus is very dense and hard.

(iv) Since a few particles were deflected it shows that the size of the nucleus is very small as compared to the total volume of an atom.

(v) The electrons revolve around the nucleus.

(vi) An atom as a whole is neutral, therefore, the number of electrons in an atom is equal to the number of protons.

(vii) Except electrons, all other fundamental particles that lie within the nucleus, are known as nucleons.

Q.6.(a) Define Group and explain them in periodic table. **(3)**

Ans **Groups:**

The vertical columns in the periodic table are called groups.

There are 18 vertical columns in the periodic numbered 1 to 18 from left to right.

Group 1 consists of hydrogen, lithium, sodium, potassium, rubidium, cesium and francium. Although elements of a group do not have continuously increasing atomic numbers, yet they have similar electronic configuration in their valence shells. That is the reason elements of a group are also called a family. For example, all the group 1 elements have one electron in their valence shells, they are given the family name of alkali metals.

The groups 1 and 2 and 13 to 17 contain the normal elements. In the normal elements, all the inner shells are completely filled with electrons, only the outermost shells are incomplete. For example, group 17 elements (halogens) have 7 electrons in their valence (outermost) shell.

The groups 3 to 12 are called transition elements. In these elements, 'd' sub-shell is in the process of completion.

Table: Different Groups of the Periodic Table

Valence electrons	Group number	Family name	General Electronic configuration
1 electron	1	Alkali metals	ns^1
2 electrons	2	Alkaline earth metals	ns^2
3 electrons	13	Boron family	$ns^2\ np^1$
4 electrons	14	Carbon family	$ns^2\ np^2$
5 electrons	15	Nitrogen family	$ns^2\ np^3$
6 electrons	16	Oxygen family	$ns^2\ np^4$
7 electrons	17	Halogen family	$ns^2\ np^5$
8 electrons	18	Noble gases	$ns^2\ np^6$

(b) Define Covalent bond and write its types with one example of each.

Ans **Covalent Bond:**

The bond, which is formed due to mutual sharing of electrons, is called a covalent bond.

Types of Covalent Bond:

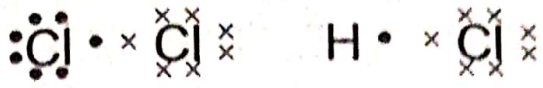
Depending upon the number of bond pairs, covalent bond is classified into following three types:

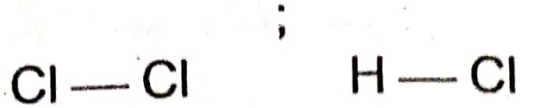
(i) Single Covalent bond (—):

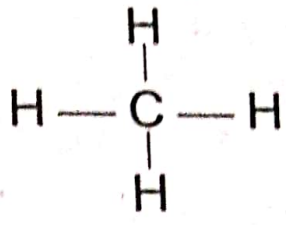
When one electron is contributed by each bonded atom, one bond pair is formed and it forms a single covalent bond. While drawing the structure of such molecules the single bond pair is indicated by a line between those two atoms. A few examples of molecules with single covalent bonds are hydrogen (H_2), chlorine (Cl_2), hydrochloric acid (HCl) and methane (CH_4).

$$H^{\bullet} + {}^{\times}H \longrightarrow H\ {}^{\bullet\times}H \quad \text{or} \quad H—H\ ;\ H_2$$

single covalent bond

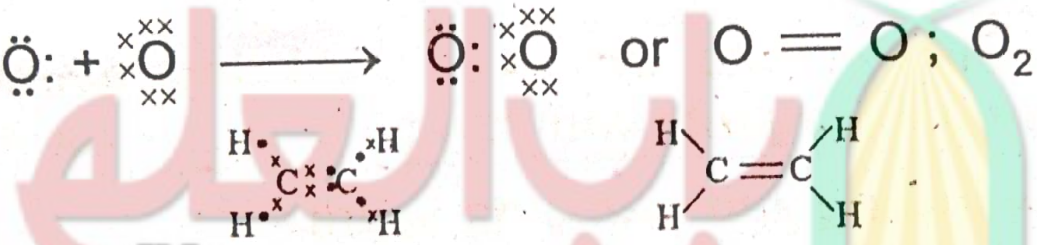






(ii) Double Covalent Bond:

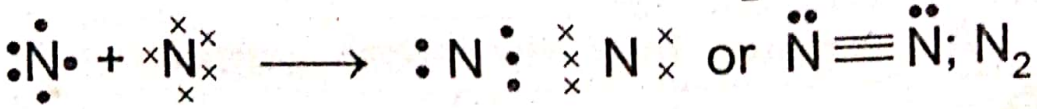
When each bonded atom contributes two electrons, two bond pairs are shared and a **double covalent bond** is formed. These bond pairs are indicated as double line between those atoms in the structure of such molecules. The molecules like oxygen (O_2) gas and ethene (C_2H_4) show such type of double covalent bonds.



(iii) Triple Covalent Bond (≡):

When each bonded atom contributes three electrons, three bond pairs are involved in bond formation. This type is called triple covalent bond. Three small lines are used to indicate these three pairs of electrons between those atoms in the molecules of such compounds. The examples of molecules having triple covalent bonds are nitrogen (N_2) and ethyne (C_2H_2).

A triple covalent bond is formed in N_2:



By this mutual sharing of valence shell electrons, each of the contributing atom attains the 'Octet' or nearest noble gas electronic configuration.

Q.7.(a) Differentiate between Amorphous solid and Crystalline solid. (3)

Ans **Crystalline solids:**

In these solids, the particles are arranged in a definite three dimensional pattern. These solids have definite faces or surfaces. Each face has definite angle with the other. They have sharp melting points e.g., diamond, sodium chloride, etc.

Amorphous solids:

Amorphous means shapeless. In these solids, the particles are not arranged in a regular manner. Moreover, they do not have sharp melting point *e.g.*, rubber, glass, etc.

(b) Discuss the effect of temperature on solubility. (4)

Ans For Answer see Paper 2015 (Group-I) Q.7.(b).

Q.8.(a) Differentiate between Oxidizing agents and Reducing agents with the help of an example. (3)

Ans **Oxidizing and reducing agents:**

An oxidizing agent is the species that oxidises a substance by taking electrons from it. The substance (atom or ion) which is reduced itself by gaining electrons is also called oxidizing agent. Non-metals are oxidizing agents because they accept electrons being more electronegative elements.

Reducing agent is the species that reduces a substance by donating electron to it. The substance (atom or ion) which is oxidized by losing electrons is also called reducing agent. Almost all the metals are good reducing agents because they have the tendency to lose electrons.

(b) Write down four chemical properties of metals. (4)

Ans Important chemical properties of metals are:

(i) They easily lose electrons and form positive ions.
(ii) They readily react with oxygen to form basic oxides.
(iii) They usually form ionic compounds with non-metals.
(iv) They have metallic bonding.

Q.9.(a) Define saturated solution. How is it prepared? (3)

Ans **Saturated solution:**

When a small amount of solute is added in a solvent, solute dissolves very easily in solvent. If the addition of solute is kept on, a stage is reached when solvent cannot dissolve any more solute. At this stage, further added solute remains undissolved and it settles down at the bottom of the container.

$$\text{Solute} + \text{Solvent} \underset{\text{crystalize}}{\overset{\text{dissolve}}{\rightleftharpoons}} \text{Solution}$$

A solution containing maximum amount of solute at a given temperature is called saturated solution. On the particle level, a saturated solution is the one, in which undissolved solute is in equilibrium with dissolved solute.

$$\text{Solute (crystallized)} \rightleftharpoons \text{Solute (dissolved)}$$

At this stage, dynamic equilibrium is established. Although dissolution and crystallization continue at a given temperature, but the net amount of dissolved solute remains constant.

(b) Give comparison of Electrolytic and Galvanic cell. (4)

Ans For Answer see Paper 2015 (Group-I), Q.9.(a).

(Part-III)

(Practical Part)

Note: Attempt any Two (2) questions.

A-(i) Which material is required for the sublimation of Ammonium Chloride? (2)

Ans Test tube, test tube holder, Bunsen burner, ammonium chloride.

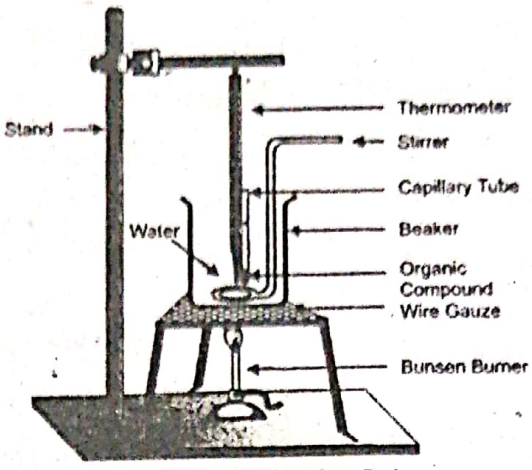
(ii) Write the procedure to determine the melting point of Naphthalene. (3)

Ans **Materials Required:**

Thermometer, beaker (250 cm^3), thread, capillary tube, tripod stand, wire gauze, stirrer, iron stand with clamp, water and given organic compound (Naphthalene).

Procedure:

(1) Close one end of the capillary tube by heating it on the flame of Bunsen burner.



Determination of Melting Point

(2) Crush the organic compound (Naphthalene) to make its powde

Observations:

No. of obs.	Melting point (°C)
1.	t_1 .....80.1 .....°C
2.	t_2 .....79.9 .....°C

$$\text{Mean value} = \frac{t_1 + t_2}{2}$$

$$= \frac{80.1 + 79.9}{2} \text{ °C}$$

Result:

Melting point of the given organic compound is 80°(

B-(i) Make a list of material to prepare 0.1 mol solution of Sodium Carbonate (Na_2CO_3). (2

Ans Distilled water, 0.1 M Na_2CO_3, measuring flask (1 cm^3), beaker, glass rod, pipette, funnel, and dropper.

(ii) Describe the procedure to prepare 100 cm^3 of (molar solution of Sodium Hydroxide (NaOH). (

Ans Top loading balance, solid NaOH, distilled wat watch glass, measuring flask (100 cm^3) with stopp spatula, funnel, beaker (100 cm^3).

C-(i) Write apparatus to prepare 250 cm^3 of 0.01 M Oxalic acid solution from the given 0.1 M solution.

Ans Weigh 3.150 g of oxalic acid on a watch glass and prepare its solution in a measuring flask (250 cm^3). Transfer the oxalic acid in a beaker and add about 20 cm^3 of distilled water in the beaker and stir it. Then transfer this solution to measuring flask. Add more distilled water to raise the level of the solution below the etched mark of the measuring flask. Now add distilled water till the lower meniscus of the solution touches the calibrated mark. Stopper the measuring flask and turn it upside down to ensure that the solution is thoroughly mixed.

(ii) Write procedure to perform that temperature affects the solubility of solids. (3)

Ans Beaker (250 cm^3), Bunsen burner, iron stand, tripod stand, wire gauze, glass rod, safety goggles, sucrose (sugar) and water.